Industrial Minerals in Nova Scotia geo*facts*

Nova Scotia Department of Natural Resources
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Introduction

Industrial Minerals produced in Nova Scotia are a group of common mineral commodities used in industry and manufacturing. These mineral resources are broadly classified as either structural materials or non-metallic minerals. Structural materials, used primarily in building and construction work, include clay and shale, aggregates (crushed stone, sand and gravel) and building stone (granite, sandstone and marble). Non-metallic minerals, used in a variety of ways, include barite, dolomite, limestone, salt, silica sand, peat moss, gypsum and anhydrite.

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Geology

In Nova Scotia, the geological units that provide the industrial minerals are as varied as the minerals themselves. These minerals, in their myriad of deposits, are an interesting and productive component of the industry throughout the entire province.

A geological unit, known as the Windsor Group, provides the largest number of industrial minerals. These deposits were created 350 to 333 million years ago, when small inland seas became very salty' due to evaporation in a hot dry climate. Large amounts of gypsum and

anhydrite (calcium sulphite), salt (halite-sodium chloride) and limestone (calcium carbonate) were precipitated from the dense salty' sea water. Huge deposits of limestone, salt, anhydrite and gypsum were created by evaporation from these ancient seas. Barite (barium sulphate, $BaSO_4$ is sometimes associated with the limestone layers.

Another large geological unit, known as the Meguma Group, encompasses the southern and western portion of Nova Scotia and is a significant source of crushed rock. This formation originated over 450 million years ago, from sediments that accumulated off the coast of Africa. The sediments were buried and compacted into shale and sandstone. Slowly the ancient ocean closed, and ancient Africa' and North America' collided about 380 million years ago. Tremendous heat and pressure, resulting from this collision, altered (metamorphosed) the shale and sandstone to slate and quartzite. Some rock melted during this and other mountain building collisions. Some of the molten material cooled and crystallized to form granite, another source of crushed rock.

Ancient limestones, more than 570 million years old, are another source of calcium carbonate and have been transformed by the heat and pressure of mountain building into marble. These are a part of a geological unit, known as the George River Group, and today provide a beautify whitish grey marble.

In the much more recent geological past, clay (approximately 11 000 years old) was deposited by water from the retreating glacier. These comparatively recent clay deposits, along with clay of Cretaceous age (approximately 100 million year old) and shale of Carboniferous age (approximately 330 million year old) provide the materials for the brick industry operated by L. E. Shaw Ltd. in Lantz, Halifax County. Silica sand also originating from the Cretaceous age river and delta deposits is mined by Nova Scotia Sand and Gravel for silica sand.

Peat is the remains of plants which have partially decomposed in bogs. At the close of the last glaciation, large amounts of peat accumulated in numerous bogs.

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Uses

Structural materials

The bulk of Nova Scotia clay and shale production is used in brick manufacture, Aggregates are used in road and highway construction, in structural concrete products such as blocks, pipes, panels and foundations, and in other construction such as railroads, breakwaters and roofing. Building stone is used as both a structural and decorative material. Historic examples of locally-produced building stone may be seen in many cities and towns in Eastern North America.

Non-metallic minerals

Barite (barium sulphate, or $BaSO_4$) produced in Nova Scotia is mainly the chemically pure pharmaceutical grade' product used in stomach and intestinal x-rays. Because it is unusually

heavy, barite is used in lubricating fluid for oil-well drilling, to add weight and to control gas and oil pressure. Barite is also used in paints, plastics, rubber, ceramics, glassware, adhesives and sealants.

Limestone (calcium carbonate, or $CaCO_3$) is essential to the manufacture of Portland cement, and it is used to reduce soil and water acidity. It is also used in stack scrubbers' to remove sulphur from coal-fired power plants. Dolomite (calcium-magnesium carbonate, or $CaMg(CO_3)_2$), often found along with limestone, is used as a flux in steel manufacture, as a building material and as a source of magnesium.

Gypsum (hydrated calcium sulphate, or $CaSO_4 2H_2O$) is used primarily in the manufacture of wallboard and plaster of Paris, for which it is calcined', or heated to remove 75 per cent of its water. Both uncalcined gypsum and anhydrite (calcium sulphate, or $CaSO_4$) are used as soil fertilizers and to slow the setting of Portland cement. Trials are currently under way for using anhydrite as a construction material in mines and buildings.

Salt has thousands of uses; in Nova Scotia, salt is used in controlling snow and ice on roads, in food processing, and in chemical and agricultural industries.

Silica sand from Nova Scotia is used mainly in brick, glass making, sandblasting and casting molds. The quality is sufficiently high for other applications, ranging from electronics and ceramics to rubber and optical glass manufacture.

Peat moss extracted in Nova Scotia is used primarily as a soil conditioner, fertilizer and growing medium. It has potential as an industrial fuel and as a source for chemicals such as waxes, resins and organic acids.

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Processing

Each of the industrial minerals has a unique process which it must undergo before it is shipped elsewhere. Granite, marble, and sandstone are cut to meet specific requirements, while aggregate of various compositions are crushed into the desirable size. Clay and shale are blended, shaped and fired to produce brick.

Prior to shipping, gypsum and anhydrite are separated (when necessary) and crushed. At Nova Scotia's salt mines, the purest rock salt is crushed; less pure forms are dissolved as a brine and evaporated, and the resulting crystals are then crushed to produce a very pure salt.

Limestone is crushed to a specific size for agriculture use. For use as cement, limestone is crushed, ground, homogenized, and slowly heated to between 1,450 to 1,650°C. This produces a material called clinker, which is finely ground to produce cement.

Barite ore is broken and screened. The ore is first processed in a magnetic separator, then an acid leaching process removes impurities and produces a pharmaceutical quality barium.

Silica sand is washed, dried and screened. A magnetic separator yields sand of glass making

quality. Last by not least, peat is harvested in Nova Scotia and shipped as bulk, bales and value-added products such as pots and mixes.

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History

Nova Scotia has produced industrial minerals for over 200 years. Locally quarried stone, clay for bricks, limestone and aggregates for concrete and mortar were used in some of the province's oldest buildings. Gypsum, anhydrite, barite and limestone have been mined and exported since the mid-18th century.

Salt production saw modest beginnings in the 19th century; large-scale operation of both rock-salt mines and brine wells began in the early and middle 20th century. Annual production rose in the 1970s from 100 000 to one million tonnes. Minerals such as barite, limestone and dolomite have been in steady production since the 19th century, while peat has been a growing industry since 1945. The Eureka mine, north of Five Islands, was the site of the first underground barite mine in Canada during the 1860s.

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Current Production

Over 70 different companies in the province produce aggregates for both local and export markets. Annual production exceeds six million tonnes. Building stone, formerly in decline, is now experiencing a gradual revival; around 3 000 t are produced per year.

Among non-metallic minerals, gypsum is by far the leader; quarries in Hants County and Cape Breton extract over six million tonnes annually, mainly for the U. S. export market, making Nova Scotia the world's largest gypsum producer. Salt mining operations at Pugwash and Nappan, Cumberland County, process around one million tonnes annually. Together these products account for the bulk of non-metallic mineral production.

Annual limestone and dolomite production exceeds 700 000 t; annual barite, peat moss and silica sand production total roughly 1 000 t, 7 500 t and 25 000 t respectively.

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Economic Significance

The total value of all industrial mineral production in 1989 was over $194 million, second only to coal ($207 million). This total represents roughly 45 per cent of total mineral wealth produced that year ($442.6 million). Some 1800 workers were directly employed in industrial mineral production. With a long tradition, steady markets and high-quality products, industrial minerals play a continuing and vital role in the province's economy.

In Nova Scotia, the economic benefits of mining are significantly enhanced by the

involvement of two levels of government under the Canada-Nova Scotia Cooperation Agreement on Mineral Development. Together, the federal and provincial governments focus on strengthening and promoting Nova Scotia's mineral industry through four activities: geological investigation, mineral technology, economic development and public awareness. These efforts, combined with the province's diverse geological environments and wide range of marketable minerals, create an optimistic future for mineral development.

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Information

For further information on minerals, mining, and geological research in Nova Scotia, please contact:

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Photos: (Not presently available)

Marble, crushed for soil conditioner and cut for building stone; was produced at Marble Mountain, Cape Breton Island.

Sandstone quarried at Wallace for building stone in the early 1900s. Sandstone is still quarried at Wallace.

Brick and clay products are manufactured by L. E. Shaw Ltd. at Lantz.

Cement is manufactured by Lafarge Canada at Brookfield from limestone quarried in the adjacent surface mine.

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Figure: (Not presently available)

Industrial Minerals - Annual Value in Dollars

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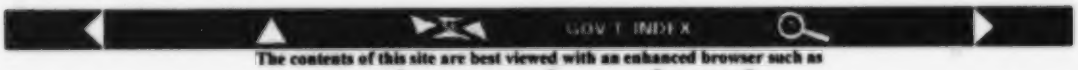
Map: (Not presently available)



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